CLAIMS

1 A method of controlling a fluid flow by a three way valve (1) having;

(a) an inlet port (2),

(b) first and second outlet ports (4, 7),

(c) a first configuration in which the valve substantially provides a path for fluid flow between the inlet port (2) and the first outlet port (4) but not between the inlet port (2) and the second outlet port (7),

(d) a second intermediate configuration in which the valve provides respective paths for fluid flow between the inlet port and each of the first and second outlet ports; and

(e) a third configuration in which the valve substantially provides a path for fluid flow between the inlet port and the second outlet port but not between the inlet port and the first outlet port,

the method including the following steps performed sequentially in the order (f) to (l);

(f) connecting the inlet port of the three way valve to a source of primary fluid at a first pressure and configuring the three way valve in the first configuration to permit the primary fluid to flow into the inlet port, through the three way valve and out from the first outlet port,

(g) connecting a supply of auxiliary fluid at a second pressure to the second outlet port,

(h) configuring the three way valve in the second intermediate configuration,

(i) discontinuing said supply of auxiliary fluid connected to said second outlet port and connecting a supply of auxiliary fluid at a third pressure to the first outlet port,

(j) permitting the primary fluid to flow into the inlet port, through the three way valve and out from the second outlet port,

(k) preventing the flow of primary fluid out from the first outlet port by configuring the three way valve in the third configuration, and

(l) discontinuing said supply of auxiliary fluid connected to said first outlet port,

wherein the second and third pressures are higher than the first pressure, and the primary fluid flow into the inlet port, through the three way valve and out from at least one of the outlet ports is substantially continuously maintained during performance of the above-mentioned steps.

2 A method of diverting a flow of primary fluid flowing into an inlet port (2) of a three way valve (1) and initially discharging from a first outlet port (4) of the three way valve to divert and discharge from a second outlet port (7) of the three way valve while maintaining a continuous flow of said primary fluid into the inlet port, the method including the following steps performed sequentially in the order (a) to (f);

(a) connecting the inlet port of the three way valve to a source of the primary fluid at a first pressure and configuring the three way valve by opening the first outlet port and closing the second outlet port to permit the primary fluid to flow into the inlet port, through the three way valve and out from the first outlet port,

(b) connecting a supply of auxiliary fluid at a second pressure to the second outlet port,

(c) configuring the three way valve by opening both outlet ports to permit the primary fluid flowing into the inlet port to flow out of either outlet port,

(d) discontinuing said supply of auxiliary fluid connected to said second outlet port and connecting a supply of auxiliary fluid at a third pressure to the first outlet port thereby diverting the flow of primary fluid initially flowing into the inlet port, through the three way valve and out from the first outlet port to instead flow out from the second outlet port,

(e) preventing further flow of primary fluid out from the first outlet port by closing the first outlet port,

(f) discontinuing said supply of auxiliary fluid connected to said first outlet port,

wherein the second and third pressures are higher than the first pressure, and the primary fluid flow into the inlet port, through the three way valve and out from at least one of the

outlet ports is substantially continuously maintained during performance of the above-mentioned steps.

3 The method as claimed in claim 1 or 2, wherein the primary fluid includes an abrasive material entrained in a carrier fluid.

4 The method as claimed in claim 1 or 2, wherein the primary fluid includes abrasive particles entrained in a carrier liquid.

5 The method as claimed in claim 4 wherein the carrier liquid is water.

6 The method as claimed in any one of the preceding claims, wherein the auxiliary fluids are water.

7 The method as claimed in any one of the preceding claims, wherein a nozzle (6) is connected to one of the outlet ports (4) for forming the primary fluid flowing therefrom into a jet.

8 The method as claimed in claim 7, wherein the primary fluid includes abrasive particles entrained in a carrier liquid and the nozzle is for forming an abrasive jet.

9 The method as claimed in claim 7 or 8, wherein a second nozzle (9) is connected to the other of said outlet ports (7).

10 The method as claimed in any one of the preceding claims, wherein the three way valve is a rotary valve.

11 The method as claimed in claim 10, wherein the rotary valve utilises a rotary wiping action with a self-lapping flat valve seat.

12 A valve arrangement for controlling the flow of a fluid, the valve arrangement including:

a three way valve (1) having;

(a) an inlet port (2) being connectable to a source of primary fluid at a first pressure,

(b) first and second outlet ports (4, 7),

(c) a first configuration in which the valve substantially provides a path for fluid flow between the inlet port (2) and the first outlet port (4) but not between the inlet port and the second outlet port (7),

(d) a second intermediate configuration in which the valve provides respective paths for fluid flow between the inlet port and each of the first and second outlet ports; and

(e) a third configuration in which the valve substantially provides a path for fluid flow between the inlet port and the second outlet port but not between the inlet port and the first outlet port,

the valve arrangement also including:

(f) a first fluid flow conduit (17) connected to the first outlet port, the first conduit having a first auxiliary valve (18) for controlling the flow of an auxiliary fluid at a second pressure to the first outlet port (4),

(g) a second fluid flow conduit (19) connected to the second outlet port, the second conduit having a second auxiliary valve (20) for controlling the flow of an auxiliary fluid at a third pressure to the second outlet port (7), and

(h) a valve controller which controls the three way valve and the first and second auxiliary valves,

the valve controller being adapted to:

(i) sequentially change the three way valve from the first configuration to the second intermediate configuration and then to the third configuration,

(j) maintain the first auxiliary valve closed and the second auxiliary valve open at least immediately prior to and during the change of the configuration of the three way valve from the first to the second configurations,

(k) open the first auxiliary valve and close the second auxiliary valve when the valve is in the second intermediate configuration,

(l) maintain the second auxiliary valve closed and the first auxiliary valve open during the change of the configuration of the three way valve from the second intermediate configuration to the third configuration; and

(m) close both first and second auxiliary valves after the three way valve has been changed to the third configuration.

13 The valve arrangement as claimed in claim 12, wherein the primary fluid includes an abrasive material entrained in a carrier fluid.

14 The valve arrangement as claimed in claim 12, wherein the primary fluid includes abrasive particles entrained in a carrier liquid.

15 The valve arrangement as claimed in claim 14 wherein the carrier liquid is water.

16 The valve arrangement as claimed in any one of claims 12 to 15, wherein the auxiliary fluids are water.

17 The valve arrangement as claimed in any one of claims 12 to 16, wherein a nozzle (6) is connected to one of the outlet ports (4) for forming the primary fluid flowing therefrom into a jet.

18 The valve arrangement as claimed in claim 17, wherein the primary fluid includes abrasive particles entrained in a carrier liquid and the nozzle is for forming an abrasive jet.

19 The valve arrangement as claimed in claim 17 or 18, wherein a second nozzle (9) is connected to the other of said outlet ports (7).

20 The valve arrangement as claimed in any one of claims 12 to 19, wherein the three way valve is a rotary valve.

21 The valve arrangement as claimed in claim 20, wherein the rotary valve utilises a rotary wiping action with a self-lapping flat valve seat.